

ORIGINAL ARTICLES

Authors alone are responsible for opinions expressed in the contribution and for its clearance through their federal health agency, if required.

MILITARY MEDICINE, 175, 6:390, 2010

Substance Use and Mental Health Trends Among U.S. Military Active Duty Personnel: Key Findings From the 2008 DoD Health Behavior Survey

Robert M. Bray, PhD*; Michael R. Pemberton, PhD*; Marian E. Lane, PhD*; Laurel L. Hourani, PhD*; Mark J. Mattiko, MEd†; LTC Lorraine A. Babeu, USA‡

ABSTRACT Objective: Examine substance use and mental health issues among U.S. military personnel. Methods: Data were from the 2008 (and before) population-based Department of Defense Health Related Behavior Surveys. The sample size for the 2008 survey was 28,546 (70.6% response rate). Results: Analyses examined substance use, stress, depression, post-traumatic stress disorder (PTSD), suicidal ideation and attempts, deployment, and job satisfaction. Trends show reductions in tobacco use and illicit drug use, but increases in prescription drug misuse, heavy alcohol use, stress, PTSD, and suicidal attempts. Deployment exacerbated some of these behavior changes. Despite the demanding lifestyle, job satisfaction was high. Conclusions: The military has shown progress in decreasing cigarette smoking and illicit drug use. Additional emphasis should be placed on understanding increases in prescription drug misuse, heavy alcohol use, PTSD, and suicide attempts, and on planning additional effective interventions and prevention programs. Challenges remain in understanding and addressing military mental health needs.

INTRODUCTION

In 1986, the Department of Defense (DoD) established the requirement to implement health promotion, disease and injury prevention programs, and population health to improve and sustain military readiness and the health, fitness, and quality of life of military personnel.¹ The military needs all service members to function at their highest possible capacity. Although DoD trains service members to be proficient in their duties, lifestyle behavior choices have the potential to affect service members' proficiency. Some "lifestyle" choices such as tobacco use, illicit drug use, excessive drinking, poor eating habits, and poor sleeping habits can have a negative impact on "fitness for duty."

To monitor and quantify issues related to lifestyle behaviors, a series of surveys was initiated in 1980. Now called the DoD Surveys of Health Related Behaviors Among Active Duty Military Personnel (HRBS), the initial intent of the surveys was to quantify these behaviors under conditions where service members could provide information about some negative lifestyle choices without fear of penalty. Through the years the survey has expanded and now includes topics such as mental health issues (stress, post-traumatic stress disorder [PTSD], anxiety, suicidal ideation and attempts), Healthy People 2010 objectives, deployment combat exposure, effect of work and family on stress level, safety issues such as injuries, helmet use, seat belt use, sexual health, and oral health.

The surveys have provided DoD with the opportunity to improve understanding of the prevalence, correlates, and consequences of some health behavior choices. Each service has implemented programs and interventions to address problem behaviors in response to survey findings. The HRBS is the largest population-based health behavior study of the force and constitutes the most representative and comprehensive data of this type available in the military.²⁻¹¹

The purpose of this article is to provide an initial descriptive overview of selected findings from the 2008 HRBS. It

*RTI International, 3040 Cornwallis Road, Research Triangle Park, NC 27709-2194.

†United States Coast Guard, 1900 Half Street SW, Rm. 9-0731, Washington, DC 20593.

‡Office of the Assistant Secretary of Defense (Health Affairs), TRICARE Management Activity, 5111 Leesburg Pike, Skyline 5, Suite 510, Falls Church, VA 22041-3206.

The views, opinions, and findings contained in this report are those of the authors and should not be construed as an official Department of Defense position, policy, or decision, unless so designated by other official documentation.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUN 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Substance Use and Mental Health Trends Among U.S. Military Active Duty Personnel: Key Findings From the 2008 DoD Health Behavior Survey				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) RTI International, 3040 Comwallis Road, Research Triangle Park, NC, 27709-2194				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Objective: Examine substance use and mental health issues among U.S. military personnel. Methods: Data were from the 2(X)8 (and before) population-based Department of Defense Health Related Behavior Surveys. The sample size for the 2008 survey was 28,546 (70.6% response rate). Results: Analyses examined substance use, stress, depression, post-traumatic stress disorder (PTSD), suicidal ideation and attempts, deployment, and job satisfaction. Trends show reductions in tobacco use and illicit drug use, but increases in prescription drug misuse, heavy alcohol use, stress, PTSD, and suicidal attempts. Deployment exacerbated some of these behavior changes. Despite the demanding lifestyle, job satisfaction was high. Conclusions: The military has shown progress in decreasing cigarette smoking and illicit drug use. Additional emphasis should be placed on understanding increases in prescription drug misuse, heavy alcohol use, PTSD, and suicide attempts, and on planning additional effective interventions and prevention programs. Challenges remain in understanding and addressing military mental health needs.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 11	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

examines the trends observed for substance use (heavy alcohol use, cigarette use, illicit drug use), mental health issues (stress, PTSD, anxiety, suicidal ideation and attempts), and job satisfaction. Additionally, it examines how these behaviors vary by deployment history. Besides the DoD services (Army, Navy, Marine Corps, and Air Force), the 2008 HRBS included the U.S. Coast Guard for the first time. Thus, the 2008 HRBS permits estimates for the entire fighting force as members of the Coast Guard have deployed to Operation Iraqi Freedom (OIF)/Operation Enduring Freedom (OEF), served on Navy ships as well as other locations overseas. This study also notes programs that assist service members in coping with challenges of the current stressful military environment.

METHODS

Sample Design and Selection

The target population included all active duty personnel except recruits, academy cadets, and persons who were absent without leave or incarcerated. The sample size for the study was determined using a statistical optimal allocation algorithm designed to optimize cost and variance considerations. The allocation used response rate assumptions and precision constraints to ensure that the resulting sample would be large enough to have adequate power to detect differences in key domains of interest. A random sample of 64 military installations worldwide was first selected from a statistical sampling frame representing all active duty personnel using a stratified, probability proportional to size methodology. The installations were stratified by branch of service (Army, Navy, Air Force, Marine Corps, and Coast Guard) and region of the world (within and outside of the continental United States, or Navy afloat). At each participating installation, 600 personnel were randomly selected within pay grades (E1–E3, E4–E6, E7–E9, W1–W5, O1–O3, and O4–O10) and gender strata. Officers and women were oversampled because of their smaller numbers in the population. Services were sampled at approximately equal numbers to permit more detailed service-level analyses, which means that smaller services (e.g., Marine Corps) were oversampled. An alternate sample that matched service members by pay grade and gender was used to replace personnel who were inaccessible due to deployments, temporary duty assignments, leave, transfers, or discharge.

For the 2008 HRBS, 40,436 active duty service members were sampled from installations or at remote locations, with 28,546 completing surveys (5,927 Army; 6,637 Navy; 5,117 Marine Corps; 7,009 Air Force; and 3,856 Coast Guard) for a response rate of 70.6%. Data were weighted to represent all active duty personnel, and poststratification methods were used to develop nonresponse adjustment factors. Updated counts of personnel were obtained from Defense Manpower Data Center, and observed eligibility rates were applied to new personnel counts for the sampling strata defined by the intersection of service, region, gender, and pay grade groups (some strata were collapsed due to small sample sizes). Adjustment factors were applied to

the weights to correct for differences in the proportion responding in the sample relative to the proportion in the population.

Data Collection

A majority of completed surveys (97.3%) were obtained by on-site administration of anonymous self-report questionnaires by civilian researchers at participating installations. Survey administration was conducted in group sessions, in which field teams described the purpose of the study, explained that participation was voluntary, and gave assurance of anonymity and instructions for participation. Optical-mark questionnaires required approximately 55 minutes to complete. The remaining surveys were obtained by mail from persons in remote locations. Institutional review board approval for the survey was obtained from RTI International and DoD.

The methodology for each prior HRBS was similar to the 2008 HRBS, except prior surveys did not use replacement sampling. Response rates ranged from 84% to 52%.

KEY MEASURES

Substance Use Measures

Alcohol

Heavy alcohol use was defined as drinking five or more drinks per typical drinking occasion at least once a week in the 30 days before the survey. The criterion of five or more drinks is a common standard in definitions of heavy drinking and binge drinking in other national surveys of civilians, such as the National Survey on Drug Use and Health (NSDUH)¹² and the Monitoring the Future study.¹³ This five or more drinks criterion has been shown to predict negative outcomes and problems in military personnel.¹⁴

Drugs

The 2008 HRBS asked about past year and past month use of illicit (nonprescription) drugs and nonmedical use of prescription drugs separately. Illicit drugs included marijuana or hashish, cocaine, LSD, PCP, MDMA, other hallucinogens, methamphetamine, heroin, GHB/GBL, and inhalants. Prescription drugs included stimulants other than methamphetamine, tranquilizers or muscle relaxers, sedatives or barbiturates, pain relievers, and anabolic steroids. "Nonmedical use" was defined as any use of these drugs without a doctor's prescription, in greater amounts or more often than prescribed, or for reasons such as to get "high," or for "thrills" or "kicks." An index of any drug use was constructed by creating use/no-use dichotomies for each drug category assigning a 1 to the index if any drug was used during the reference period. Drug definitions were adapted from those used in NSDUH.¹²

Cigarettes

Cigarette smoking was defined as having smoked at least 100 cigarettes in one's lifetime and having smoked cigarettes during the past 30 days. Cigarette definitions were adapted from those used in NSDUH.¹²

Mental Health Measures

Stress

Stress was based on self-reports of participants' perceptions of stress in their lives. Respondents reported how much stress they perceived in the past year from their military work and from their intimate and family relationships. They also reported perceived impact of stress experiences on their military work performance. Our perceived stress items were developed by the Army for the 1988 HRBS⁵ and have been in use since that time to track changes in self-reported work and family stress.

Anxiety

Need for further anxiety evaluation was assessed using items adapted from the Patient Health Questionnaire.¹⁵ Respondents who reported feeling nervous, anxious, or on edge, worrying a lot, and experiencing three or more symptoms (on more than half of the days) in the past month met screening criteria.

Depression

Need for further depression evaluation was assessed using the three-item version-A Burnam depression screen.¹⁶ Personnel were defined as needing further evaluation or assessment if they (a) felt sad, blue, or depressed for 2 weeks or more in the past 12 months; or (b) reported 2 or more years in their lifetime of feeling depressed and felt depressed "much of the time" in the past 12 months; and (c) felt depressed on 1 or more days in the past week.

Post-Traumatic Stress Disorder

Need for further PTSD evaluation was assessed using the 17-item PTSD Checklist-Civilian Version (PCL).¹⁷ Personnel scoring 50 or more were classified as needing further evaluation for PTSD.¹⁸ The civilian version of the PCL was selected to assess PTSD symptoms that may be the result of either military or nonmilitary experiences (i.e., traumatic exposures that occurred before joining the military or that occurred outside of military duty).

Suicidal Ideation and Suicide Attempts

Suicidal ideation and attempts were assessed by asking respondents whether they had seriously considered suicide or attempted suicide within the past year. Individuals responded on the basis of their own definitions of what it meant to them as having seriously considered or attempted suicide.

COMBAT DEPLOYMENT MEASURE

Combat deployment experiences were assessed by items that asked about the number of combat deployments since September 11, 2001 and about specific operational theaters where service members served: OIF/OEF, or other combat theaters (such as Operations Desert Shield/Desert Storm in the Persian Gulf and Operation Restore Hope in Somalia). Personnel were categorized into three groups: those who had been combat deployed and served in OIF/OEF, those who had been combat deployed to other theaters, and those who had not been combat deployed.

Job Satisfaction Measure

Job satisfaction in 2008 was assessed with a general question: "All in all, how satisfied or dissatisfied are you with your cur-

rent primary military occupational specialty (MOS)/Primary Specialty (PS)/Rating/Designator/Air Force Specialty Code (AFSC)?" Responses were very satisfied, satisfied, dissatisfied, or very dissatisfied. It did not examine details about location, supervisor, or perceptions of officers/enlisted personnel with their unit. Job satisfaction was assessed in a similar way in earlier surveys but asked about work assignment rather than job specialty. Job satisfaction was defined as persons reporting they were "satisfied" or "very satisfied" with their current job specialty (2008) or work assignment (1995 to 2005).

Statistical Analyses

The SUDAAN software for the statistical analysis of correlated data in complex survey designs was used to develop estimates and standard errors.¹⁹ Because Coast Guard data were not available until 2008, they were not included in trend estimates. Analyses of combat deployment and theater that utilize only 2008 data do include the Coast Guard.

Analyses of trends across survey years were not adjusted for changes in the demographics of the military, because prior analyses indicated that they had only small effects.²⁰ Comparisons of health-related behaviors based on combat deployment and theater were adjusted for sociodemographic differences. All differences reported between survey years or between subgroups were statistically significant ($p < 0.05$).

RESULTS

Sociodemographic Distributions Across Survey Years

Table I presents distributions of sociodemographic characteristics among service members in 1980, 1988, 1998, 2002, 2005, and 2008. The military population across all years was predominantly male, White, and with pay grades of E4-E6. The profile pattern across the 28-year period shows that the proportion of women, Hispanic, and other racial/ethnic groups, college-educated personnel, and personnel aged 35 years and older increased significantly between 1980 and 2008. The demographic profile for 2008 is highly similar to that for 2005, suggesting that including the Coast Guard in 2008 did not alter the sociodemographic make-up of the force.

Trends in Substance Use

Figure 1 presents trends from 1980 to 2008 in the percentage of active duty personnel who engaged in any cigarette use, heavy alcohol use, and any illicit drug use in the 30 days before the survey. Cigarette smoking declined from 1980 to 1998, significantly increased from 1998 to 2002, and subsequently trended downward. The 2008 rate was similar to the 1998 rate. Heavy alcohol use increased significantly between 1980 and 1982, decreased significantly between 1982 and 1988, remained relatively stable between 1988 and 1998, and increased significantly from 1998 to 2008.

Illicit drug use declined sharply from 1980 to 2002. The 2005 prevalence was 5%, and the 2008 prevalence was 12%. Because of redesigned question wording, estimates including prescription

TABLE I. Sociodemographic Characteristics of Eligible Participant Population in Selected Survey Years

Sociodemographic Characteristic	Survey Year					
	1980 (N = 15,268)	1988 (N = 18,673)	1998 (N = 17,264)	2002 (N = 12,756)	2005 (N = 16,146)	2008 ^a (N = 28,546)
Gender						
Male	91.2 (0.7)	88.8 (1.0)	86.3 (0.7)	83.1 (0.8)	85.2 (0.7)	85.8 (0.8)
Female	8.8 (0.7)	11.2 (1.0)	13.7 (0.7)	16.9 (0.8)	14.8 (0.7)	14.2 (0.8)
Race/Ethnicity						
White, Non-Hispanic	70.7 (1.4)	69.4 (0.9)	64.5 (0.9)	67.3 (1.3)	64.4 (1.2)	64.3 (1.0)
African American, Non-Hispanic	18.8 (1.3)	18.5 (0.8)	17.6 (0.8)	20.7 (1.4)	17.6 (1.0)	16.3 (0.8)
Hispanic	4.6 (0.4)	8.0 (0.6)	10.8 (0.5)	7.1 (0.4)	8.8 (0.5)	10.4 (0.4)
Other	5.8 (0.4)	4.1 (0.3)	7.1 (0.4)	5.0 (0.5)	9.2 (0.6)	9.0 (0.5)
Education						
High School Diploma or Less	53.9 (1.6)	42.9 (1.5)	31.3 (1.2)	36.0 (1.6)	33.9 (1.5)	32.7 (1.3)
Some College	30.4 (1.2)	34.7 (0.9)	46.3 (1.0)	44.3 (1.2)	44.1 (1.3)	45.1 (0.8)
College Degree or More	15.7 (1.2)	19.4 (1.4)	22.4 (1.4)	19.7 (1.6)	22.0 (1.7)	22.2 (1.6)
Age						
20 or Younger	21.3 (1.4)	13.8 (1.1)	10.2 (0.6)	13.8 (1.0)	14.1 (1.1)	14.7 (1.0)
21–25	35.2 (1.1)	30.4 (1.2)	28.4 (0.9)	32.9 (1.2)	32.6 (1.2)	32.1 (1.3)
26–34	27.8 (1.1)	34.4 (1.0)	34.4 (0.7)	28.8 (0.7)	30.3 (1.0)	29.3 (0.7)
35 or Older	15.6 (1.1)	21.4 (1.4)	27.0 (1.0)	24.5 (1.7)	23.1 (1.4)	23.9 (1.4)
Family Status						
Not Married	47.1 (1.4)	39.3 (1.9)	39.9 (0.7)	44.3 (1.2)	45.8 (1.4)	45.8 (1.1)
Married	52.9 (1.4)	60.7 (1.9)	60.1 (0.7)	55.7 (1.2)	54.2 (1.4)	54.2 (1.1)
Rank						
E1–E3	27.2 (1.5)	21.0 (1.4)	18.9 (0.9)	22.0 (1.6)	24.0 (1.7)	20.9 (1.3)
E4–E6	50.2 (1.0)	51.9 (1.0)	52.5 (1.2)	51.9 (1.0)	49.6 (1.8)	51.7 (2.3)
E7–E9	8.2 (0.6)	10.4 (0.6)	10.8 (0.4)	10.8 (0.8)	9.7 (0.8)	10.2 (0.5)
W1–W5	1.1 (0.2)	1.0 (0.1)	1.2 (0.1)	1.2 (0.2)	1.0 (0.1)	1.5 (0.6)
O1–O3	8.3 (0.6)	9.6 (0.7)	9.5 (0.8)	8.3 (0.5)	9.4 (1.0)	9.3 (0.7)
O4–O10	5.0 (0.7)	6.1 (0.7)	7.2 (0.7)	5.8 (1.1)	6.3 (0.8)	6.4 (0.7)
Response Rate	93.3	81.4	59.0	51.6	51.8	70.6

Table entries are column percentages (with standard errors in parentheses).

^a2008 sociodemographic characteristics include the Coast Guard. The 2008 characteristics including the Coast Guard do not differ statistically from the four DoD services excluding the Coast Guard.

drug misuse in 2005 and 2008 are not directly comparable to prior surveys and are not included in the Figure 1 trend line. An additional line from 2002 to 2008 shows estimates excluding prescription drug misuse indicating that those rates were very low and did not change. Figure 2 shows the relation of prescription drug misuse to the estimates from 2002 to 2008. As shown, changes from 2002 to 2008 resulted largely from higher reported rates of prescription drug misuse. Prescription drug misuse doubled from 2002 to 2005 and almost tripled from 2005 to 2008.

Trends in Perceived Stress and Sources of Stress

Table II shows that reports of “a lot” of stress at work was consistent from 2002 to 2005, then decreased significantly in 2008. There was no change from 2002 to 2008 in the percentage reporting a lot of stress in their family. Similarly, there were no changes from 2002 to 2008 in reports that work stress interfered with job performance. However, the percentage reporting that family stress interfered a lot with job performance was slightly, but significantly, higher in 2002 than in 2005 or 2008.

Table III presents trends in sources of stress reported by DoD personnel from 2002 to 2008. The most frequently reported source of stress across all years was being away from family.

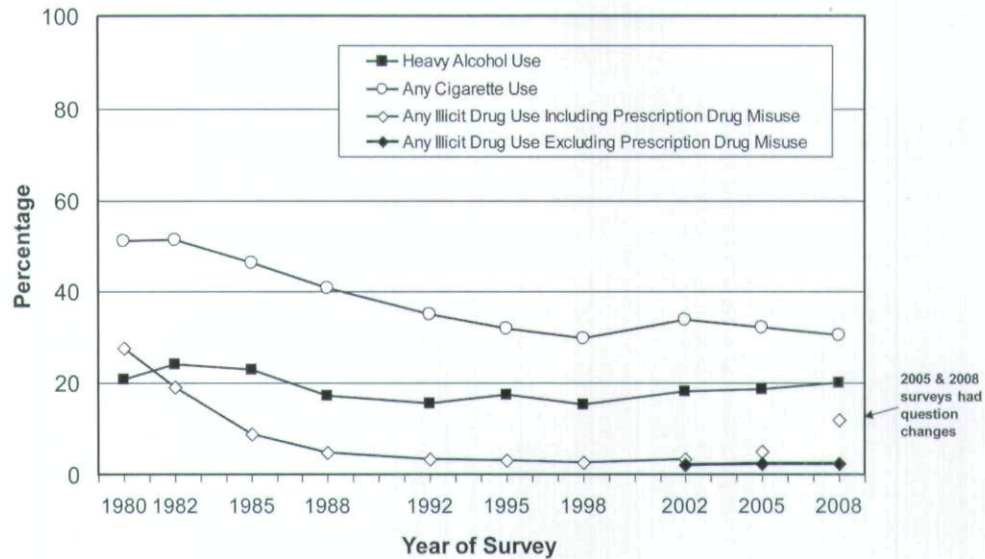
Other top sources of stress in 2008 were deployment, increases in workload, conflicts between military and family responsibilities, and undergoing a permanent change of station, all of which showed significant increases from earlier surveys.

Differences in Selected Mental Health Measures

Table IV presents mental health differences between 2005 and 2008. About one in seven personnel met screening criteria for needing further anxiety evaluation in 2008, and about one in five met criteria for needing further depression evaluation. These estimates are similar to 2005 rates. In contrast, the percentage needing further PTSD evaluation increased from 2005 to 2008. There was no change from 2005 to 2008 in the rate of seriously considering suicide in the past year, but there was a significant increase in rates of reported suicide attempts.

Differences in Job Satisfaction

In 2008, 70.2% of active duty DoD personnel indicated they were “satisfied” or “very satisfied” with their current work assignment, a significant increase over rates in 2002 (65.3%) and 2005 (66.2%). The rate in 2008 was similar to the rates seen in 1995 (71.0%) and 1998 (72.9%).



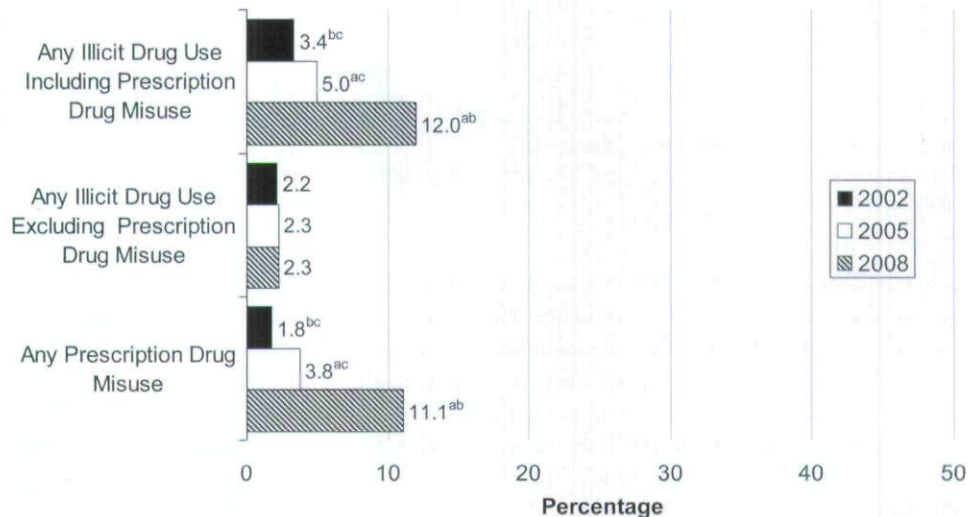
Heavy Alcohol Use = 5 or more drinks on the same occasion at least once a week in past 30 days.

Any Illicit Drug Use Including Prescription Drug Misuse = use of marijuana, cocaine (including crack), hallucinogens (PCP, MDA, MDMA, and other hallucinogens), heroin, methamphetamine, inhalants, GHB/GBL, or non-medical use of prescription-type amphetamines/stimulants, tranquilizers/muscle relaxers, barbiturates/sedatives, or pain relievers.

Any Illicit Drug Use Excluding Prescription Drug Misuse = use of marijuana, cocaine (including crack), hallucinogens (PCP, MDA, MDMA, and other hallucinogens), heroin, inhalants, or GHB/GBL.

Source: Alcohol Drinking Level, Q21-Q29 and Q35-Q37; Any Illicit Drug Use Including Prescription Drug Misuse: Past 30 Days, Q81-Q83, Q86a-d, Q87a-d, and Q88a-d; Any Illicit Drug Use Excluding Prescription Drug Misuse: Past 30 Days, Q81a-f, h-j, Q82a-f, h-j, and Q83a-f, h-j; Any Smoking, Q54, Q56.

FIGURE 1. Trends in past 30 day substance use, 1980–2008.



^a Estimate is significantly different from the 2002 estimate at .05 level.

^b Estimate is significantly different from the 2005 estimate at .05 level.

^c Estimate is significantly different from the 2008 estimate at .05 level.

Any Illicit Drug Use Including Prescription Drug Misuse = use of marijuana, cocaine (including crack), hallucinogens (PCP, LSD, MDMA, and other hallucinogens), heroin, methamphetamine, inhalants, GHB/GBL, or nonmedical use of prescription-type amphetamines/stimulants, tranquilizers/muscle relaxers, barbiturates/sedatives, or pain relievers.

Any Illicit Drug Use Excluding Prescription Drug Misuse = use of marijuana, cocaine (including crack), hallucinogens (PCP, LSD, MDMA, and other hallucinogens), heroin, inhalants, or GHB/GBL.

Any Prescription Drug Misuse = nonmedical use of prescription-type amphetamines/stimulants (including any use of methamphetamine), tranquilizers/muscle relaxers, barbiturates/sedatives, or pain relievers.

Source: Any Illicit Drug Use Including Prescription Drug Misuse, Q81-Q83, Q86a-d, Q87a-d, and Q88a-d; Any Illicit Drug Use Excluding Prescription Drug Misuse, Q81a-f, h-j, Q82a-f, h-j, and Q83a-f, h-j; Any Prescription Drug Misuse, Q81g, Q82g, Q83g, Q86a-d, Q87a-d, Q88a-d.

FIGURE 2. Trends in past 30 day use of selected illicit drug categories, 2002, 2005, and 2008.

Selected Substance Abuse and Mental Health Measures by Deployment and Theater

Table V presents prevalence of substance abuse and mental health measures of the entire active military community, including Coast Guard, by history of combat deployment

since September 11, 2001, and by deployment theater. These results controlled for demographic differences among service members in the three deployment groups. As shown, heavy alcohol use was higher among personnel who had been deployed to any operational theater than among those who

TABLE II. Trends in Perceived Stress at Work and in Family Life in Past 12 Months, DoD Services,^a 2002, 2005, and 2008

Service/Type and Level of Stress	Year of Survey ^b					
	2002 ^c		2005 ^c		2008	
Stress at Work						
A lot	32.3	(1.3)***	31.9	(0.9)***	27.1	(0.7)*,***
Some	30.3	(0.6)	30.6	(0.6)	29.3	(0.4)
A little	24.4	(0.8)	23.2	(0.7)***	25.1	(0.5)**
None at all/Had no Stress at Work	13.0	(0.8)***	14.4	(0.6)***	18.5	(0.6)*,***
Stress in Family						
A lot	18.7	(0.5)	18.5	(0.5)	17.6	(0.5)
Some	24.9	(0.4)***	25.2	(0.6)***	20.6	(0.3)*,***
A little	32.5	(0.8)***	31.7	(0.8)	30.1	(0.4)*
None at all/Had no stress in Family	23.9	(0.8)***	24.5	(0.7)***	31.7	(0.6)*,***
Work Stress Interfered with Job Performance						
A lot	9.9	(0.6)	10.0	(0.6)	10.2	(0.5)
Some	18.4	(0.8)	17.5	(0.5)	18.1	(0.4)
A Little	26.7	(0.5)	27.5	(0.5)	26.3	(0.4)
None at all/Had no Stress at Work	45.1	(1.3)	45.0	(0.9)	45.4	(0.8)
Family Stress Interfered with Job Performance						
A lot	6.0	(0.3)*,***	4.6	(0.3)*	5.1	(0.3)*
Some	10.9	(0.5)**	9.3	(0.4)*,***	10.3	(0.2)**
A little	21.0	(0.4)**	23.5	(0.5)*,***	21.6	(0.5)**
None at all/Had no Stress in Family	62.1	(0.8)	62.6	(0.7)	63.1	(0.6)

Table displays the percentage of military personnel by service who reported the indicated type and level of stress in the past 12 months. The standard error of each estimate is presented in parentheses. Estimates have not been adjusted for sociodemographic differences between survey years.

*Estimate is significantly different from the 2002 estimate at the 95% confidence level; **estimate is significantly different from the 2005 estimate at the 95% confidence level; ***estimate is significantly different from the 2008 estimate at the 95% confidence level. ^aDoD services includes Army, Navy, Marine Corps, and Air Force. ^b2005 estimates may differ from estimates published elsewhere. The variables used to construct the 2005 estimates in this table were edited to be consistent with the 2008 study.

TABLE III. Trends in Sources of Stress in Past 12 Months, DoD Services,^a 2002, 2005, and 2008

Stressor	Survey Year					
	2002		2005		2008	
Deployment	11.7	(1.4)***	13.4	(1.2)	16.4	(1.4)*
Having a Permanent Change of Station (PCS)	5.5	(0.3)***	6.3	(0.7)***	9.5	(0.4)*,***
Problems with Coworkers	10.1	(0.6)	8.6	(0.6)	9.4	(0.4)
Problems with Supervisor	10.4	(0.6)	9.6	(0.7)	9.2	(0.4)
Concern About Performance Rating	5.6	(0.4)	5.2	(0.3)***	6.4	(0.2)**
Increases in Work Load	14.2	(0.7)	12.9	(0.5)***	14.9	(0.4)**
Decreases in Work Load	2.1	(0.2)	1.6	(0.2)***	2.4	(0.2)**
Insufficient Training	NA	NA	6.9	(0.4)***	9.1	(0.4)**
Being Away from Family	17.2	(1.0)***	16.6	(1.1)***	22.5	(1.1)*,***
Having a Baby	NA	NA	5.2	(0.3)***	6.8	(0.4)**
Finding Childcare/Daycare	NA	NA	3.5	(0.2)***	5.4	(0.2)**
Death In Family	NA	NA	5.4	(0.3)***	6.7	(0.4)**
Divorce or Breakup	NA	NA	5.8	(0.4)***	7.6	(0.4)**
Infidelity or Unfaithfulness By You or Partner	NA	NA	NA	NA	6.7	(0.4)
Conflicts Between Military and Family Responsibilities	10.9	(0.6)**	9.2	(0.5)*,***	12.2	(0.5)**
Problems with Money	9.8	(0.6)**	7.9	(0.6)*	8.6	(0.4)
Problems with Housing	5.4	(0.3)**	4.4	(0.3)*,***	6.2	(0.3)**
Personal Health Problems	4.3	(0.3)***	4.4	(0.4)***	6.1	(0.4)*,***
Family Health Problems	5.8	(0.2)***	6.0	(0.3)***	7.1	(0.3)*,***
Behavior Problems in Children	2.3	(0.2)***	2.2	(0.1)***	3.4	(0.1)*,***
Unexpected Event/Problem	NA	NA	3.1	(0.4)	3.1	(0.2)

NA, not applicable or data not available. Table displays the percent of military personnel by gender that reported the indicated source of stress was "a lot" in the past 12 months. The standard error of each estimate is presented in parentheses. Estimates have not been adjusted for sociodemographic differences between survey years.

*Estimate is significantly different from the 2002 estimate at the 95% confidence level; **estimate is significantly different from the 2005 estimate at the 95% confidence level; ***estimate is significantly different from the 2008 estimate at the 95% confidence level. ^aDoD services includes Army, Navy, Marine Corps, and Air Force.

TABLE IV. Differences in Selected Mental Health Measures, DoD Services,^a 2005 and 2008

	Survey Year			
	2005		2008	
Need for Further Anxiety Evaluation, Past 30 Days	12.7	(0.5)	14.2	(0.6)
Need for Further Depression Evaluation, Past 7 Days	22.3	(0.8)	21.2	(0.6)
Need for Further PTSD Evaluation, Past 30 Days	6.7	(0.5)	10.7	(0.6)*
Seriously Considered Suicide				
Past Year	4.9	(0.3)	4.6	(0.2)
Not Within Past Year but Since Joining Service	6.9	(0.3)	3.3	(0.2)*
Not Within Past Year but Before Joining Service	7.0	(0.3)	3.8	(0.2)*
Attempted Suicide ^b				
Past Year	0.8	(0.1)	2.2	(0.2)*
Not Within Past Year but Since Joining Service	1.3	(0.1)	1.1	(0.1)
Not Within Past Year but Before Joining Service	3.0	(0.2)	2.5	(0.2)

Table displays the percentage of military personnel by service who reported the mental illness/suicide response as indicated in the rows. The standard error of each estimate is presented in parentheses. Estimates have not been adjusted for sociodemographic differences between survey years.

*Estimate is significantly different from the 2005 estimate at the 95% confidence level. ^aDoD services includes Army, Navy, Marine Corps, and Air Force. ^b2005 estimate for suicide attempts may differ from estimates published elsewhere. The variables used to construct the 2005 estimates were edited to be consistent with the 2008 study.

had not been deployed. The pattern was similar for past 30 day cigarette use, with higher rates for those who had been combat deployed than for those who had not. There were no differences by theater for any past year illicit drug use including prescription drug misuse. Interestingly, those who had been combat deployed in theaters other than OIF/OEF had a significantly higher rate of past year illicit drug use (excluding prescription drug misuse) compared with those who served in OIF/OEF or those who had not been combat deployed.

Perceived high work stress in the past 12 months was significantly higher among personnel in any operational theater than among those who had not been deployed. Rates of experiencing high family stress in the past 12 months were significantly higher among those deployed to OIF/OEF than those deployed to other operational theaters or those who had not been deployed.

Rates of needing further depression evaluation did not differ by theater. However, those deployed to OIF/OEF were more likely to need further anxiety evaluation compared with those who had not been deployed. Similarly, rates of needing further PTSD evaluation were higher among those who had served in OIF/OEF or other combat theaters compared with those who had not been combat deployed. Suicidal ideation was higher among those who had served in other operational theaters compared with those who had served in OIF/OEF or those who had not been combat deployed. Suicide attempts were more likely among those who had not been deployed compared with those who have served in OIF/OEF.

TABLE V. Standardized Estimates of Selected Substance Use and Mental Health Issues, by Deployment Theater, All Services,^a 2008

Substance Use/Mental Health Issue	Deployment Theater					
	Combat Deployed Since Sept 11, 2001 and Served in Operation Iraqi or Enduring Freedom		Combat Deployed Since Sept 11, 2001 and Did Not Serve in Operation Iraqi or Enduring Freedom		Not Combat Deployed Since Sept 11, 2001	
Heavy Alcohol Use, Past 30 Days	21.0	(1.3)***	21.4	(1.3)***	17.9	(1.0)*,***
Any Cigarette Use, Past 30 Days	31.7	(1.3)***	31.6	(1.4)***	27.8	(1.3)*,***
Any Illicit Drug Use Including Prescription Drug Misuse, Past 12 Months	21.5	(0.9)	21.5	(1.4)	19.7	(0.8)
Any Illicit Drug Use Excluding Prescription Drug Misuse, Past 12 Months	5.2	(0.5)**	8.6	(1.0)*,***	5.7	(0.7)**
High Stress at Work, Past 12 Months	28.7	(1.0)***	29.1	(1.8)***	24.6	(0.8)*,***
High Stress in Family, Past 12 Months	19.1	(0.7)***	16.5	(0.9)*	16.2	(0.4)*
Need for Further Anxiety Evaluation, Past 30 Days	15.6	(0.8)***	14.2	(1.3)	12.4	(0.4)*
Need for Further Depression Evaluation, Past 7 Days	21.4	(0.8)	22.5	(1.1)	20.2	(0.6)
Need for Further PTSD Evaluation, Past 30 Days	12.4	(0.8)***	13.3	(1.2)***	8.2	(0.4)*,***
Seriously Considered Suicide, Past Year	4.4	(0.3)**	6.6	(0.4)*,***	4.2	(0.3)**
Attempted Suicide, Past Year	1.8	(0.2)***	2.6	(0.5)	2.3	(0.2)*

Table displays the percentage of military personnel who reported the substance use/mental health issue as indicated in the rows. The standard error of each estimate is presented in parentheses. Estimates have been adjusted for sociodemographic differences between the three Combat/Theater groups.

*Estimate is significantly different from the estimate for Combat Deployed Since Sept 11, 2001 and Served in Operation Iraqi or Enduring Freedom at the 95% confidence level; **estimate is significantly different from the estimate for Combat Deployed Since Sept 11, 2001 and Did Not Serve in Operation Iraqi or Enduring Freedom at the 95% confidence level; ***estimate is significantly different from the estimate for Not Combat Deployed Since Sept 11, 2001 at the 95% confidence level. ^aAll services include Army, Navy, Marine Corps, Air Force, and Coast Guard.

DISCUSSION

This article presents a descriptive overview of key findings from the 2008 HRBS, including data from prior surveys with a focus on trends in key substance abuse and mental health indicators. The focus is principally driven by leading health indicators from Healthy People 2010.²¹

Findings showed considerable progress in reducing cigarette use in U.S. service members over the past 28 years. Still, in 2008, 31% of active duty personnel were cigarette smokers.¹¹ Many factors contribute to tobacco use of which cigarette smoking has the highest prevalence.¹¹ A recent review by an Institute of Medicine committee concluded that tobacco use is a function of the interplay of individual attributes, interpersonal factors, community influences, and societal influences.²² Social norms and peer influence are important contributors.²³⁻²⁶ Indeed, social factors have been asserted to be the strongest predictors of tobacco use.²⁷ Having friends who smoke and view smoking as important increases service members' risk of smoking. Although challenges remain to further decrease smoking rates, the reductions since 1980 are notable. This decline is likely a function of a similar trend in the civilian population, the military's emphasis on health promotion programs that discourage tobacco use paired with smoking cessation programs, bans on smoking in federal buildings, and educational efforts by commanders.

Illicit drug use also declined dramatically from 1980 (28%) to 2002 (3%). Illicit drug use excluding prescription drug use remained at low levels. This is most likely the result of drug testing programs and of military culture not tolerating illicit drug use by its members. The military began drug testing in 1971 as a deterrent to drug use by U.S. troops serving in Vietnam. It was stopped in the mid-1970s, however, due to legal challenges associated with limitations in drug confirmation procedures and cost concerns about wide-scale drug testing. In 1981, drug testing was reinstituted following new breakthroughs in drug-testing confirmation procedures and more rigorous chain-of-custody procedures for tracking urine samples that were adequate to overcome earlier legal objections.²⁸⁻³⁰

In contrast to the reductions in illegal drug use, prescription drug misuse has shown higher rates in recent years (4% in 2005; 11% in 2008). Explanations for this are complicated. In an effort to provide clarity, wording changes were made in the 2005 and 2008 iterations of the survey, which have made it difficult to determine how much of these differences represent true increases in prescription drug misuse and how much are the result of questionnaire (methods) variation. Because of multiple potential explanations, the magnitude of the prescription drug misuse increases should be interpreted cautiously. However, if prescription drug misuse in the military is increasing, the finding is consistent with increases observed among civilians.³¹⁻³⁴ As the military copes with providing care to wounded service members the possibility of increasing prescription drug misuse will need to be a monitoring priority and will need further study.

Heavy alcohol use, which was relatively steady from 1988 to 1998, showed a significant increase from 1998 (15%) to

2008 (20%). This increase raises two key concerns: (1) heavy use and binge drinking are associated with higher rates of negative consequences^{11,14} and (2) alcohol use may be a self-medicating behavior for other problems such as mental health issues.³⁵ Co-occurring conditions such as anxiety, depression, and PTSD are conditions that are known to increase the misuse of alcohol. In either case, the trend suggests further attention and/or interventions are needed to encourage abstinence or responsible alcohol use.

Findings also indicated that fewer active military personnel perceived high amounts of stress at work in 2008 (27%) compared with 2005 (32%) or 2002 (32%). Job satisfaction increased from 2005 (66%) to 2008 (70%). Given the stressors in the military during a time of war, these results may on the surface seem surprising. However, personnel currently deployed in war zones were not included in the study, so reports about stress at work may not reflect the most current combat environments. In addition, the increased operational tempo resulting from the September 11, 2001 attacks has been ongoing since that date without break; therefore, it may be that personnel perceive and report lower levels of stress at work not because the stressors are fewer or less intense, but because they have adjusted to the stressors over time. Consistent with expectations, those who had served in combat zones since September 11, 2001 were more likely to report high work stress than those who had not been combat deployed. Further examination of length and recency of deployment and their impact on reported stress levels is warranted. Personnel listed issues related to service in combat zones (e.g., being away from family, deployment, conflicts between military and family responsibilities) among the most common sources of stress in 2008 and showed significant increases from 2005 to 2008.

The 2008 findings provide a mixed message regarding the mental health of the military community. Despite the ongoing war, there was no change from 2005 to 2008 in the percentage of personnel needing further anxiety or depression evaluation. However, there was a significant increase in the percentage needing further PTSD evaluation. Consistent with expectations, those who had served in combat deployments (OIE and OEF, 12.4%; other combat deployment, 13.3%) were more likely to need further PTSD evaluation than those who had not been deployed to combat zones (8.2%). There also was a significant increase from 2005 to 2008 in reports of attempted suicide in the past year, consistent with other reports of increases in Army suicides.³⁶ Notably, attempts were more likely among those who had not been combat deployed, suggesting that the increases are not simply a function of combat stress. Reducing the stigma of mental health concerns in the military must remain a priority in conjunction with enhanced screening of high-risk individuals and resiliency training. Although those who had reported attempting suicide in the past year were likely considered not deployable, more thorough predeployment screening for suicidal ideation may limit suicides and suicide attempts during and post-deployment.

To help address the challenges of military life, especially during periods of conflict, the military has implemented prevention, intervention, and treatment programs that address substance use, stress, and mental health issues. These programs have changed over time to adapt to the changing social and military environment and vary by service, but they typically share common models and elements. Substance abuse programs take a community approach that encourages responsible choice based on leadership involvement, individual responsibility, base installation community participation, and local community partnerships. Other programs are tailored to fit the severity of the problem. Early intervention services are provided for personnel at risk for developing substance-related problems; outpatient services treat service members' level of clinical severity to help achieve permanent changes; intensive outpatient treatment/partial hospitalization includes education and treatment while allowing patients to apply newly acquired skills; and in-patient services provide a planned regimen of care in a 24-hour live-in setting.

Mental health programs provide services to military members and families to address the psychological effects of war. The Post Deployment Health Risk Assessment implemented in 2005 provides service members the opportunity to identify physical or behavioral health concerns that may not have been present immediately after redeployment. This assessment has helped identify personnel experiencing symptoms of stress-related disorders and get them early care. A recent suicide prevention program dubbed "Ask, Care, Escort" (ACE) was launched in February 2009 to ensure that service members learn risk factors of suicidal persons and how to intervene when needed. Despite these programs, further refinements are needed. For example, depression, anxiety, and PTSD may co-occur with substance use. Further analyses of HRBS data can help quantify the co-occurrence and identify relevant subgroups for focused interventions.

In evaluating findings, some limitations should be acknowledged. First, declining response rates over time with relatively low rates in the 2002 (56%) and 2005 (52%) surveys raises the possibility of potential bias in these survey years. This issue was partially addressed by using weight adjustments, but that may not have ruled out all potential bias. However, the observed increase in rates of heavy drinking and cigarette use from 1998 to 2002 argues against bias, because these increases would not be expected if users had been missed in the surveys. In addition, the response rate was higher in 2008 (71%), but observed rates were relatively stable or lower from 2005 to 2008 for several indicators, such as illicit drug use (excluding prescription drug misuse), cigarette use, stress at work, and depression.

Second, we designed our procedures around self-report validity studies.^{37,38} A general conclusion emerging from these reviews is that most people are truthful when they believe the research has a legitimate purpose, they have suitable privacy for providing answers, they have assurances that answers will be kept confidential, and they trust those collecting the data.³⁷⁻³⁹ We encouraged honest reporting by assuring that (1) questionnaire responses were anonymous; (2) civilian data

collectors explained the confidentiality of the data and assured participants that installation personnel would not have access to the information; (3) military personnel not participating in the survey (i.e., command leadership) were required to leave the room during survey administration sessions; and (4) experienced data collectors gained the trust of respondents by following explicit procedures established and maintained across numerous iterations of the survey. Data from pilot test focus groups suggest that respondents were accepting of these procedures and willing to be forthcoming in their responses.

Third, data are based on self-reports and may be subject to memory errors. However, the large number of respondents, use of sampling weights, anonymity of the survey, and consistency of estimates across surveys suggest the extent of potential bias is small.

Fourth, due to improvements in questionnaire wording from the 2005 to 2008 survey iterations, estimates including prescription drug misuse in 2005 and 2008 are not directly comparable to prior survey iterations. These changes are likely the combined result of real increases in the misuse of prescription drugs in the military, improvements in question wording, or both. Because of multiple potential explanations, the magnitude of these increases should be interpreted cautiously.

CONCLUSIONS

The HRBS, along with other metrics, provide DoD leadership with an understanding of health-related behaviors among active duty personnel. The military has shown notable progress in decreasing cigarette smoking and illicit drug use. Additional emphasis should be placed on understanding increases in prescription drug misuse, heavy alcohol use, PTSD, and suicide attempts, and on planning additional effective interventions and prevention programs. Challenges remain in addressing and understanding the mental health needs of the force.

ACKNOWLEDGMENTS

The authors thank Dr. M. Ward Casscells, Dr. Jack Smith of DoD (Health Affairs), and Dr. Thomas Williams of TRICARE Management Activity for their support in obtaining funding for the study and for their interest and oversight of the study. Similarly, we thank Ms. Stephanie Zidek-Chandler from the U.S. Coast Guard for her assistance in obtaining Coast Guard funding and providing supervision for the study. We extend appreciation to Mr. Justin Faerber for editorial assistance in preparing the manuscript and to the members of the study team from RTI who participated in questionnaire development, sampling, data collection, and analyses of the 2008 HRBS. The latter include (a) Mr. Michael Witt, senior statistician who oversaw statistical analyses and significance testing, (b) Ms. Kristine L. Rae Olmsted who managed data editing and quality control of the estimates and was coauthor for the final report, (c) Dr. Janice M. Brown who provided expertise for alcohol measures and was coauthor on the study's final report, (d) Ms. BeLinda Weimer who led questionnaire development and was coauthor for the report, (e) Dr. Mary Ellen Marsden who provided senior oversight for drug use items and was a coauthor and reviewer for the final report, (f) Mr. Scott Scheffler who conducted sampling and weighting activities for the project, (g) Mr. Russ Vandermaas-Peeler and Ms. Kimberly R. Aspinwall who oversaw data collection for the study, (h) Ms. Erin Anderson who served as project manager and assisted with preparation of figures and checking of tables, and (i) Ms. Kathy Spagnola, Ms. Kelly Close, Ms. Jennifer L. Gratton, Ms. Sara Calvin,

and Mr. Michael Bradshaw who assisted with table production and checking. This study was funded by Contract GS-10F-0097L, Task Order W81XWH-07-F-0538 from the Department of Defense and Task Order HSCG23-07-F-PMD047 from the U.S. Coast Guard to RTI International.

REFERENCES

1. Department of Defense: Health Promotion and Disease/Injury Prevention. Directive no. 1010.10 (supersedes and cancels March 11, 1986 version of directive no. 1010.10). Washington, DC, Department of Defense, 2003.
2. Burt MA, Biegel MM, Carnes Y, Farley EC: Worldwide Survey of Non-Medical Drug Use and Alcohol Use Among Military Personnel: 1980. Bethesda, MD, Burt Associates, Inc., 1980.
3. Bray RM, Guess LL, Mason RE, Hubbard RL, Smith DG: 1982 Worldwide Survey of Alcohol and Nonmedical Drug Use Among Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 1983.
4. Bray RM, Marsden ME, Guess LL, et al: 1985 Worldwide Survey of Alcohol and Nonmedical Drug Use Among Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 1986.
5. Bray RM, Marsden ME, Guess LL, Wheelless SC, Iannacchione VG, Keesling SR: 1988 Worldwide Survey of Substance Abuse and Health Behaviors Among Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 1988.
6. Bray RM, Kroutil LA, Luckey JW, et al: 1992 Worldwide Survey of Substance Abuse and Health Behaviors Among Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 1992.
7. Bray RM, Kroutil LA, Wheelless SC, et al: 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 1995.
8. Bray RM, Sanchez RP, Ornstein ML, et al: 1998 Department of Defense Survey of Health Related Behaviors Among Military Personnel. Final report (prepared for the Assistant Secretary of Defense [Health Affairs], U.S. Department of Defense, Cooperative Agreement No. DAMD17-96-2-6021, RTI/7034/006-FR). Research Triangle Park, NC, Research Triangle Institute, 1999.
9. Bray RM, Hourani LL, Rae KL, et al: 2002 Department of Defense Survey of Health Related Behaviors Among Military Personnel. Final report (prepared for the Assistant Secretary of Defense [Health Affairs], U.S. Department of Defense, Cooperative Agreement No. DAMD17-00-2-0057/RTI/7841/006-FR). Research Triangle Park, NC, Research Triangle Institute, 2003.
10. Bray RM, Hourani LL, Rae Olmsted KL, et al: 2005 Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 2006.
11. Bray RM, Pemberton MR, Hourani LL, et al: 2008 Department of Defense Survey of Health Related Behaviors Among Active Duty Military Personnel. Research Triangle Park, NC, Research Triangle Institute, 2009.
12. Substance Abuse and Mental Health Services Administration: Results from the 2008 National Survey on Drug Use and Health: National Findings (Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 09-4434). Rockville, MD, 2009.
13. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE: Monitoring the future national survey results on drug use, 1975-2008. Volume II: College Students and Adults Ages 19-50 (NIH Publication No. 09-7403). Bethesda, MD, National Institute on Drug Abuse, 2009.
14. Stahre MA, Brewer RD, Fonseca VP, Maimi TS: Binge drinking among active-duty military personnel. *Am J Prev Med* 2009; 36: 208-17.
15. Spitzer RL, Kroenke K, Williams JB: Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary care evaluation of mental disorders. Patient Health Questionnaire. *JAMA* 1999; 282: 1737-44.
16. Rost K, Burnam MA, Smith R: Development of screeners for depressive disorders and substance disorder history. *Med Care* 1993; 31: 189-200.
17. Weathers FW, Litz BT, Huska JA, Keane TM: The PTSD Checklist-Civilian Version (PCL-C). Boston, MA, National Center for PTSD, 1994.
18. Forbes D, Creamer M, Biddle D: The validity of the PTSD checklist as a measure of symptomatic change in combat-related PTSD. *Behav Res Ther* 2001; 39: 977-86.
19. RTI: SUDAAN User's Manual, Release 8.0. Research Triangle Park, NC, Research Triangle Institute, 2002.
20. Bray RM, Hourani LL: Substance use trends among active duty military personnel: findings from the United States Department of Defense health related behavior surveys, 1980-2005. *Addiction* 2007; 102: 1092-101.
21. Department of Health and Human Services: Healthy People 2010: Understanding and Improving Health, Ed 2, Washington, DC, U.S. Government Printing Office, 2000.
22. Institute of Medicine: Combating Tobacco Use in Military and Veteran Populations. Washington, DC, The National Academies Press, 2009.
23. Buller DB, Borland R, Woodall WG, Hall JR, Burris-Woodall P, Voeks JH: Understanding factors that influence smoking uptake. *Tob Control* 2003; 12: 16-25.
24. Green KJ, Hunter C, Bray RM, Pemberton MR, Williams J: Peer and role model influences for cigarette smoking in a young adult military population. *Nicotine Tob Res* 2008; 10: 1533-41.
25. Hunter C, Hayes J, Brehm W, Bennett W: Role-model's smoking behavior linked to smoking initiation and re-initiation in young adults. *Ann Behav Med* 2000; 22: S091.
26. Jackson C: Initial and experimental stages of tobacco and alcohol use during late childhood: relation to peer, parent, and personal risk factors. *Addict Behav* 1997; 22: 685-98.
27. Haddock CK, Klesges RC, Talcott GW, Lando H, Stein RJ: Smoking prevalence and risk factors for smoking in a population of United States Air Force basic trainees. *Tob Control* 1998; 7: 232-5.
28. Greden JF, Morgan DW, Frenkel SI: The changing drug scene: 1970-1972. *Am J Psychiatry* 1974; 131: 77-81.
29. Irving J: Drug testing in the military: technical and legal problems. *Clin Chem* 1988; 34: 637-40.
30. Robins LN, Davis DH, Goodwin DW: Drug use by U.S. army enlisted men in Vietnam: A follow-up on their return home. *Am J Epidemiol* 1974; 99: 235-49.
31. McCabe SE, Cranford JA, West BT: Trends in prescription drug abuse and dependence, co-occurrence with other substance use disorders and treatment utilization: results from two national surveys. *Addict Behav* 2008; 33: 1297-305.
32. Riggs P: Non-medical use and abuse of commonly prescribed medications. *Curr Med Res Opin* 2008; 24: 869-77.
33. Killen JD, Robinson TN, Haydel KF, et al: Prospective study of risk factors for the initiation of cigarette smoking. *J Consult Clin Psychol* 1997; 65: 1011-6.
34. Twombly C, Kristen D, Holtz K: Teens and the misuse of prescription drugs: evidence-based recommendations to curb a growing societal problem. *J Prim Prev* 2008; 29: 503-16.
35. Khantzian EJ: The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence. *Am J Psychiatry* 1985; 142: 1259-64.
36. Kuehn BM: Soldier suicide rates continue to rise: military, scientists work to stem the tide. *JAMA* 2009; 301: 1111-3.
37. Harrison LD: The validity of self-reported data on drug use. *J Drug Issues* 1995; 25: 91-111.
38. Rouse BA, Kozel NJ, Richards LG (editors): Self-report methods of estimating drug use: meeting current challenges to validity. NIDA Research Monograph 57. DHHS Publication no. ADM 85-1402. Rockville, MD, National Institute on Drug Abuse, 1985.
39. Johnston LD, O'Malley PM: Issues of validity and population coverage in student surveys of drug use. In: Self-Report Methods of Estimating Drug Use: Meeting Current Challenges to Validity. Edited by Rouse BA, Kozel NJ, Richards LG. NIDA Research Monograph 57, DHHS Publication no. ADM 85-1402. Rockville, MD, National Institute on Drug Abuse, 1985; 31-54.

Copyright of Military Medicine is the property of Association of Military Surgeons of the United States and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.